FACULTY WORKING PAPER 93-0148

The Cognitive Organization of Competition: The Case of Scottish Knitwear

Joseph F. Porac
Professor of Business Administration
University of Illinois

Howard Thomas
Professor of Business Administration
University of Illinois

Fiona Wilson
University of St. Andrews

Douglas Paton
Curtin University

Alaina Michaelson
Ph.D. Student
University of Illinois

Bureau of Economic and Business Research
College of Commerce and Business Administration
University of Illinois at Urbana-Champaign

BEBR

FACULTY WORKING PAPER NO. 93-0148

College of Commerce and Business Administration

University of Illinois at Urbana-Champaign

July 1993

The Cognitive Organization of Competition: The Case of Scottish Knitwear

Joseph F. Porac
Howard Thomas
Fiona Wilson
Douglas Paton
Alaina Michaelson

The Cognitive Organization of Competition: The Case of Scottish Knitwear

by

Joseph F. Porac
University of Illinois at Urbana-Champaign

Howard Thomas
University of Illinois at Urbana-Champaign

Fiona Wilson
University of St. Andrews

Douglas Paton
Curtin University

Alaina Michaelson
University of Illinois at Urbana-Champaign

Address all correspondence to:

Joseph Porac
Department of Business Administration
University of Illinois at Urbana-Champaign
350 Commerce West
1206 S. Sixth Street
Champaign, IL 61820

Running Head: Cognitive Organization

The Cognitive Organization of Competition: The Case of Scottish Knitwear

ABSTRACT

We report the results of research undertaken to map the cognitive structures underlying competition in the Scottish knitwear industry. Drawing from research and theory on cognitive categorization, the research addresses three questions: (1) What is the cognitive ordering that managers use to make sense of organizational variation, (2) What organizational attributes seem to be involved in this accepted ordering, and (3) Does the collective mental model of organizational forms bear any relation to the pattern of competitive interactions in the industry. The results suggest that a six category cognitive ordering best describes the commonsense of competition in the industry, and that an ensemble of attributes involving size, technology, product style, and geographic location forms the foundation for this ordering. In addition, the results suggest that this six cluster ordering is reproduced within the pattern of competitive relationships reported by managers in the industry.

THEORETICAL BACKGROUND

Several organizational theorists have argued that consensual belief systems define and stabilize interorganizational relationships (e.g., Abrahamson & Fombrun, 1992; Fombrun, 1986; Huff, 1982; DiMaggio & Powell, 1991; Scott,1992; Spender, 1989). Supporting this argument is research suggesting that organizational fields are socially constructed when rules, classifications, scripts, and reputational rankings diffuse across organizations and become objectified through organizational activities (Powell & DiMaggio, 1991; Fombrun, 1986). To understand the evolution and structure of organizational fields it is thus necessary to describe not only the material transactions occurring across interorganizational networks, but also the taken-for-granted nomenclatures and social realities that make transactions sensible to the actors involved (e.g., Fombrun, 1986; DiMaggio & Powell, 1991; Scott, 1992).

Although social constructionism usefully calls attention to the cognitive underpinnings of organizational fields, to date most studies advancing the social constructionist agenda have emphasized the conceptualization and measurement of practice rather than mind. Much of this research has been designed to show how organizational activities are shaped by institutionalized cognitive structures over time (e.g., DiMaggio & Powell, 1991). However, the cognitive constructs used to account for institutional effects have remained implicit and only indirectly assessed. Indeed, the cognitive micro theory of social constructionism, at least as it applies to interorganizational research, is largely undeveloped (DiMaggio & Powell, 1991; Scott, 1992). Recent insights from the cognitive sciences have not been well integrated into interorganizational analysis, and few studies have employed empirical methods that permit direct and systematic assessment of an organizational field's cognitive content. In light of these absences, and without a developed micro theory, attempts to use cognitive constructs to explain interorganizational dynamics are somewhat ad hoc.

The present study addresses the behaviorial bias of current social constructionist research by explicitly modeling the cognitive substrates of an industry. Specifically, our objective is to map from the point-of-view of the actors involved the structure of "competitive boundaries" among a group of firms. The problem of competitive boundaries can be stated as follows: Given a set of N organizations, how can subsets of organizations of n_i be formed such that the competitive intensity within each group is greater than the competitive intensity across groups and in N as a whole. The boundary problem is a particularly appropriate subject for cognitive research for two reasons.

First, cognitively mapping the boundaries of competition may expand and clarify current conceptualizations of competitive groups. Within economics (e.g., Tirole, 1988), organizational theory (e.g., Carroll, 1984; Hannan & Freeman, 1989), and strategy research (e.g., McGee & Thomas, 1986), attempts to model the dynamics of rivalry have generally focused upon defined subsets of organizations such as "industries," "populations," and/or "strategic groups." Most researchers assume that such groupings correspond to the competitive structure of an organizational field. This has generated intense debate concerning the criteria used to demarcate group boundaries (e.g., Auerbach, 1988; Barney & Hoskisson, 1990; Boyer, 1979; McKelvey, 1982; Nightengale, 1978). These debates have yet to be satisfactorily resolved and raise important questions about the appropriateness of various classificatory standards and philosophies. It is interesting, in this regard, to inquire about the utility of a social constructionist approach to boundary definition, particularly because the same boundary problems arise in constructionist studies of organizational fields as well. As DiMaggio (1991) notes, the very meaning of an "organizational field" is predicated upon some notion of field boundaries, and many of the processes that social constructionists take as essential to field structuration (e.g., imitation, coercion, etc.) require actors to make

discriminations among relevant and irrelevant organizational forms. Thus, the cognitive processes underlying competitive boundaries are fundamental to the social constructionist point-of-view.

Second, the competitive boundary problem provides a well-defined and tractable context for advancing a social constructionist perspective on competition and markets. Organizational competition is heavily laced with cognitive content. Arrow (1985), for example, suggests that even in fragmented perfectly competitive environments actors must possess an internalized representation of market parameters (e.g., the demand curve) to make reasonable decisions about market entry, pricing, and output levels. When competitive relationships are concentrated, these representational models must broaden to consider the actions and motivations of rival firms. Thus, the real-time dynamics of competition are controlled by sensemaking processes in which actors are interpreting competitive circumstances and adjusting their product, pricing, and output positions accordingly (e.g., White, 1981; Dickson, 1992).

Unfortunately, these market sensemaking processes have been ignored in the organizational literature. The dominant paradigm for studying competition has been organizational ecology (e.g., Hannan & Freeman, 1989). The aggregated level of analysis in most ecological studies lacks the fidelity to describe the microscopic variable-sum interactions characterizing most competitive relationships. Moreover, ecology's realist epistomology assumes away many of the sensemaking processes that competitive relationships entail. As Meyer, Boli, and Thomas (1987) argue, realist models of social systems reify cognitive orderings that are actually the result of negotiation and social construction. The accepted objectivity of organizational forms in ecological studies obscures the fact that an "organization" is an intellectual product rooted in a matrix of cultural nomenclatures and institutions (e.g.,

Douglas, 1986). Organizations are meaningful only because such nomenclatures parse organizational activities into commonly understood categories and descriptive labels. Similarly, the meaning of organizational "populations" as bounded collectivities is contingent upon socially understood systems of classification that distinguish member from non-member organizations (e.g., Albert & Whetten, 1985; DiMaggio, 1982). How such cognitive orderings intersect with and shape competitive interactions among firms can only be indirectly inferred from ecological research. A social constructionist analysis of competition and field boundaries thus fills an important theoretical gap in the organizational literature.

The present research attempts to capture the socially constructed competitive boundaries existing within the Scottish knitwear industry. We have argued elsewhere that competitive boundaries are rooted in a collective mental model of the competitive environment (Porac & Thomas, 1990). The "commonsense" of competition is a process of discrimination in which actors interpret environmental cues, categorize and label organizational forms using accepted industry nomenclatures, and then employ the resulting classification to define the relevant competitive field for their organizations. When cognitive classifications are shared by actors across the field, the intersubjective belief system is reproduced within a collective pattern of competitive definitions and perceived boundaries. For present purposes, the Scottish knitwear industry is a particularly useful venue for investigating competitor mental models since the industry's geographic isolation and long history have produced a well-understood cognitive ordering of member organizations. We have conducted extensive ethnographic field research in the industry for three years. Our goal has been to map the socio-cognitive basis of rivalry among firms. In an earlier paper, we outlined some of the cognitive processes that underly competitive interactions in the industry (Porac, Thomas, and Baden-Fuller, 1989). The present research expands Porac et al.'s tentative study of a small

number of knitwear companies into a cognitive classification of firms across the entire industry. We seek to obtain a cognitive snapshot of the current "cultural model" (D'Andrade, 1989) that incumbent actors use to make sense of organizational variation in the industry.

COMPETITION, CATEGORIZATION, AND THE EPISTEMIC CONTEXT OF THE SCOTTISH KNITWEAR INDUSTRY

Wool production in Scotland can be traced to at least the 13th Century. Evidence for handknitted goods dates to the 16th Century in the Shetland Islands, although industry experts typically trace the beginning of large scale knitwear production to the New Mills Woolen Manufactury founded in 1681 at Haddington, outside of Edinburgh (Gulvin, 1984). Today, there are approximately 270 firms across Scotland, accounting for roughly 25% of total UK knitwear production. Most of these firms are single business units with relatively narrow product lines. Figure 1 provides a stylized summary of the core value-added chain around which the organizational field of this industry has developed over the last three centuries. The focus of the present research is the horizontal "knitwear firms" segment in the Figure.

---

insert Figure 1 about here

Three centuries of field structuration have produced (a) a well-developed industry nomenclature for describing field activities, (b) a deeply established belief system to rationalize industry events, (c) stabilized transactional routines to move resources across the value chain, and (d) accepted trade associations, periodicals, and professional schools to coordinate and disseminate industry practices. Taken in its entirety, this highly institutionalized environment provides contemporary actors with a rich yet cognitively stable epistemic context having three important characteristics. First, the cognitive sedimentation from 300 years of knitwear production has resulted in a complex language for making very fine discriminations among raw materials and production techniques. Even the simplest V-neck sweater is the outcome

of hundreds of technical choices among thousands of known product and process alternatives. The conceptual base of the industry has evolved over the years to codify the sheer variety inherent in the business.

Second, this complex technical nomenclature has become intertwined with the very identity of firms themselves. The historical trajectory of knitting technology has produced highly specialized and inflexible machinery. Each type of machine can produce only a narrow range of alternative outputs. Production techniques are thus clearly apparent in the resulting product attributes and are often used by experts as product descriptions (e.g., "This is a 15-gauge fully fashioned cardigan."). Because any single firm has only a limited range of machinery at a given time, much of the firm's operation is revealed in its product characteristics.

Third, a large part of industry discourse focuses upon product/process attributes. Trade associations (e.g., the Scottish Knitwear Association) publish directories that list the technologies of member firms, companies themselves distribute glossy brochures listing production capabilities, trade shows are regularly organized to showcase the full range of Scottish products, and raw material suppliers are ever willing to disseminate useful production intelligence and advice. As a result of this discourse, detailed information about the identities of firms is readily available to those who seek it. Actors' beliefs about their own and other companies thus have an extensive informational base to draw from, particularly with respect to the product and technical variety among firms.

Enacting a Competitive Field

These conditions create the epistemic context within which Scottish firms make sense of their competitive environment and define their position within the knitwear industry. From the point-of-view of a single knitwear firm, the equivocality of competition is largely a result of

a "competitive cusp" between two opposing strategic pressures (Porac et al.,1989). On the one hand, the institutionalized environment of the industry creates supply-side pressures to conform to accepted product and process logics. Many of these isomorphic forces operate matter-of-factly and without much discussion. Certain core logics, however, are conciously attended to and incorporated into explicit statements about organizational goals and identity. For example, there is widespread agreement in the industry that a particular Scottish "image" is a major reason for the success of the country's knitwear products. Thus, firms consciously attempt to both draw from and reinforce a Scottish image in their own knitwear lines. This objective ramifies backward through a firm's core technology and reduces the strategic degrees of freedom available for managing the business. At the same time, however, considerable demand-side pressures for organizational differentiation are created by retailers and the fashion community who are constantly seeking new and innovative knitwear designs, shorter lead times, smaller lot sizes, and more favorable price points. To accommodate these demand-side pressures, firms must favorably differentiate their unique combination of product attributes, prices, and contractual arrangements from other firms in the industry. In the end, whether a knitwear firm succeeds or fails depends upon how well it differentiates itself while still retaining enough similarity with other firms to preserve its status as a legitimate member of the industry.

Managers confront this strategic tradeoff as they "enact" their competitive environment. According to Weick (Weick, 1979; Daft & Weick, 1984), enactment occurs when managerial elites sample environmental information, interpret the meaning of such information by integrating it into existing knowledge structures, and then take action on the basis of the resulting interpretation. Enactment is essentially a continuous cycle of information sampling, managerial interpretation, and organizational resource allocation. As it applies to competitive

sensemaking within the knitwear industry, the core of this cycle is discovery and reasoning about similarities and differences among member firms. Key elements of the cycle are depicted in Figure 2. Moving from left to right in Figure 2, the competitive field of Scottish knitwear consists of organizational activities that are labeled with the industry's nomenclature and taken as given by industry participants. Some of these activities are directly accessible to managers such as when firms observe each other's products and sales tactics at an industry

---

insert Figure 2 about here

---

trade show, or when managers from one company visit the production facilities of another. Most activities, however, become public knowledge only indirectly through second-hand industry discourse. The vast bulk of interorganizational information consists of rationalized accounts about organizational practices distributed through formal and informal communication channels.

These accounts largely control what managers do and do not know about the competitive field. Over time, knitwear managers have sifted through the discourse of the industry and developed beliefs about the characteristics of specific firms. The attribute beliefs of experienced managers are often quite elaborate and encompassing. It is not uncommon for such beliefs to include knowledge of firms' products and prices, organizational structure, personnel, geographic location, cost structures, technology, reputation, and recent performance. Strong attribute beliefs about one's own and other firms encourage interfirm comparisons. Using this comparative information, managers infer attribute similarities and differences, identify rivals, and assess perceived areas of competitive opportunities. Over time, many firms have taken the necessary steps to exploit these perceived opportunities within the constraints of their available resources. In the simplest cases, firms have adjusted

their prices and/or made small changes in the characteristics of their products to imitate other organizations. In more complex cases, new technologies (e.g., electronic knitting equipment, computer-aided design stations) have been purchased to acquire capabilities that competitors do not have. In these very subtle ways, attribute beliefs and comparisons are the socio-cognitive core of rivalry in the industry. Thus, which firms are used as competitive referents and which are ignored heavily influences the industry's competitive dynamics.

The Competitive Boundary Problem in the Scottish Context

It is in establishing competitive referents that the boundary problem arises in everyday sensemaking. The 270 knitwear firms in the industry are unevenly distributed over 30,000 square miles of Scottish territory. Despite the highly institutionalized environment of the industry, no two firms are identical in all respects. Thus, knowledgeable knitwear managers are faced with a complex discrimination problem in distinguishing friends from foes. If all firms in the industry are used as competitive referents, environmental scanning and competitive sensemaking become impossibly difficult due to the sheer variety inherent in knitwear production. If, on the other hand, no other firms are used as referents, competitively important areas of organizational similarity will be ignored. Somehow, knitwear managers must use their attribute knowledge of the industry to define cognitively tractable boundaries of competition among firms that strike a meaningful balance between a very broad and a very narrow conceptualization of the competitive milieu.

According to Porac and Thomas (1990), managers resolve competitive boundary problems by resorting to an underlying "business definition" that psychologically delineates a firm's competitive position vis-a-vis others in the environment. A business definition is a stable focusing device that orients managerial attention toward some sectors of an industry and away from others (e.g., Abell, 1980). Porac and Thomas suggest that this focusing effect is a

result of managers matching the charactersitics of known organizations to "cognitive taxonomies" of organizational types. Many cognitive scientists have argued that the categorization of natural objects, people, and events is driven by the use of hierarchical cognitive structures that summarize correlational patterns in the environment (e.g., Anderson, 1983; Lakoff, 1987; Medin, 1989; Rosch, 1978; Smith, 1989; Smith & Medin, 1981; Thagard, 1992). In the case of competitive categorization, the relevant cognitive taxonomies consist of organizational categories ranging from the very abstract (e.g., "manufacturing firms") to the very specific (e.g., "men's clothing stores"). Each category is cognitively represented by a set of attributes that has come to be associated with that organizational form.

Cognitive theory suggests that categorization processes simplify competitive comparisons by coalescing around perceived attributes of firms that have high organizational diagnosticity (e.g., Rosch, 1978; Smith & Medin, 1981). Diagnosticity is a function of the correlational structure of attributes. When a stable ensemble of correlated attributes is perceived to exist across organizations, a category forms to summarize the ensemble's structure. Thus, highly correlated attributes are used most heavily in the categorization process. Once a category is stabilized, defining a business essentially entails matching a firm's characteristics to a category attribute list and then using this match as a reference point around which competitive boundaries are cognitively constructed. Organizational taxonomies reduce the cognitive load of competitive comparisions because the number of attributes that must be compared is substantially reduced. Once an organization has been categorized, similarities and differences with other firms need be assessed only on a reduced set of highly diagnostic attributes rather than on all possible attribute dimensions.

A number of studies have successfully uncovered managerial cognitive taxonomies within specific competitive contexts. Walton (1986), for example, observed that managers in

the New York City financial sector classified banks into "downtown" and "suburban" institutions. A similar cognitive ordering in the Chicago banking community was observed recently by Reger and Huff (1993). Porac and Thomas (in press) show how grocery managers in a small city organize their competitive definitions around locally accepted "supermarket" and "convenience store" categories. In Porac and Thomas' study, the categories "supermarket" and "convenience store" bifurcated the competitive environment into two non-overlapping groups whose members defined each other as rivals.

Our initial work in Scotland led us to believe that a similar cognitive ordering of organizational forms structures competitive boundaries among knitwear firms. There were strong indications within our interview data that an accepted classification of firms segments the industry into "cognitive oligopolies" whose member firms define each other as rivals and use each other as benchmarks in pricing, product, and output decisions (Porac et al., 1989). Our exploratory interview data did not permit us to examine this cognitive structure very systematically, but they did raise a number of theoretically and methodogically important questions about the existence of cognitive oligopolies within the industry. The present research addresses three of these questions:

Q1. What is the cognitive ordering of firms in the industry? That is, how many organizational categories are commonly recognized, and what is the attribute structure of each?

Q2. Given that knitwear firms vary along hundreds of dimensions, around what diagnostic attribute beliefs has the cognitive ordering of the industry coalesced?

Q3. Is the industry's categorical structure reproduced within the relational network of competitive referents among firms? That is, if two firms are members of the same cognitive group, will they be more likely to use each each other as a

competitive referent in strategic decisions?

To address these questions, we use several analytic strategies to examine relationships among three classes of variables: attribute descriptions of firms, perceived category membership of firms, and relational referent ties within the industry. The research was undertaken in two stages. First, extensive field interviews were conducted with industry participants to develop a comprehensive list of the organizational dimensions that are used in attribute descriptions of firms in the industry. In effect, this list can be considered the "space" of attribute beliefs about member firms. These same interviews were also employed to develop an hypothesized cognitive ordering of the competitive environment using the category labels of the industry participants themselves. Second, a questionnaire was constructed that asked managers within the industry to describe their firms on the attribute dimensions gleaned from the interview data, to categorize their firm using the hypothesized cognitive ordering of the industry, and finally to note which other firms in the industry the managers viewed as competitors and used as benchmarks in their strategic decisions. We use cluster analysis on various subsets of the self descriptions to (a) determine the most diagnostic attribute ensemble within the perceived attribute space of the industry, and (b) to verify and describe in detail the hypothesized cognitive ordering of member firms. We use network analysis to examine whether the cognitive ordering of firms constructed in this way is reproduced within the relational network of competitive referents in the industry.

RESEARCH METHOD

The general boundaries of the Scottish knitwear industry can be defined using Scotland's territorial borders. For purposes of the present study, all firms with company headquarters located within Scotland are considered industry members. Few foreign companies have Scottish subsidiaries and those that do have essentially purchased private

Scottish firms and then organized them as independent business units under local management. Most knitwear managers have deep Scottish roots and heavily identify with the industry's national identity. For reasons of geography, strategy, and identity, it is reasonable to conclude that most firms are competitively focused on other Scottish companies rather than on their foreign counterparts (empirical evidence supporting this conclusion will be presented below). Within Scotland itself, there are clear demarcations between "knitwear" firms and companies engaged in related businesses such as weaving and/or the production of specialized textiles--respective trade associations are different, students at local institutes and colleges follow different curricula, and personnel transfers across sector boundaries rarely occur. In general, then, the "Scottish knitwear industry" seems to represent a coherent and bounded group of firms pursuing similar specialized activities. To operationalize industry boundaries, a master list of member firms was compiled from trade association membership rosters, the ICC Financial Survey of the Knitwear Industry in Scotland, Kelly's Business Directory, the Scottish Council of Development and Industry's List of Manufacturing Companies in Scotland, The Wool Trade Directory of the World, The UK & Eire Index of Suppliers, and various promotional brochures from Scottish tourist and trade bureaus. These sources enumerated 262 firms with known knitwear outputs, the most exhaustive tabulation of the industry ever completed.

Field Interviews

Describing an organizational field from the point-of-view of the actors involved requires ethnographic knowledge of the nomenclature of the industry and how this nomenclature is used to frame attribute beliefs and to categorize organizational practices. Open-ended ethnograpic interviews (e.g., Spradley, 1979) were used to elicit managerial discourse on these matters without imposing any arbitrary starting assumptions about the social reality of

the industry. Managing Directors from 20 firms were randomly selected and interviewed at their place of business. In addition, three industry experts from trade associations and/or technical schools were used as industry informants to help verify and interpret the information obtained from managers.

The managerial interviews were conducted in two stages. First, respondents were asked to describe the details of their current business from the point of purchasing yarn to the delivery of goods to retailers. This portion of the interview was quite extensive and covered most aspects of the firm's activities. Since our earlier work suggested that the technical details of knitwear production were important elements in the attribute beliefs of industry participants, particular attention was given to the strategic choices that were made in the firm's technical core. For example, if an MD noted that his/her firm specialized in "9-gauge Shetland sweaters," efforts were made to unpack this choice and obtain more detailed information about the considerations involved (e.g., "How did you come to specialize in 9-gauge?" "Why not expand into 7-gauge?" "What other gauges have you considered?"). In this way, through a series of detailed explications, contrast sets were developed for the key choice points in the firm's value-added activities (e.g., Spradley, 1979). The explications for all 20 interviews were combined using the industry's own language and conceptual system to frame the alternatives. With the help of our industry informants, we distilled the interview information into a set of 11 key aspects of knitwear production, with each aspect having several choice alternatives. Ordered from beginning to end in the value-added process, these dimensions and their attribute variants are listed in Figure 3. Rather than being a complete scientific description of the industry, Figure 3 should be interpreted as the basic nomenclature

---

insert Figure 3 about here

---

that actors use to describe a firm's technical core.

The second stage of the interview obtained from each respondent a cognitive taxonomy of Scottish knitwear firms. Several ethnographic techniques are available to elicit taxonomic knowledge (e.g., Porac & Thomas, 1987). The method used in the present research was modeled after Metzger and Williams (1966) and Kempton (1978). Beginning with the abstract category "Scottish knitwear firms," respondents were asked to move down an abstraction hierarchy by making finer and finer discriminations among organizational categories. The starting question was "Are there different types of Scottish knitwear firms, or are they all the same?" If respondents did not report any differences within the industry, the taxonomic task was terminated. However, if subtypes of Scottish knitwear firms were reported, each subtype was recorded verbatim and used to structure the next iteration of the taxonomic procedure. For each subtype mentioned, the respondent was asked "Are there different types of [*subtype*], or are they all the same?" Again, any subtypes were recorded verbatim, and this process was repeated until respondents were unable to generate any additional subtypes of firms within the industry. In this way, the interview isolated a cognitive ordering for each respondent that consisted of category labels used to describe the industry's organizational variation. Examples of complete taxonomies obtained from four respondents are listed in Appendix A.

Of the 20 cognitive taxonomies elicited from interview respondents, 13 had three levels of abstraction, 4 had two levels, 2 had four levels, and 1 made no distinctions among Scottish knitwear firms at all . For purposes of the present research, retaining complete taxonomic verticality by isolating common type-subtype distinctions was not of interest. Even though a taxonomic ordering can consist of several levels of abstraction, Porac and Thomas (in press) show that managers tend to use one level (the "basic" level)

more heavily in their organizational categorizations. Instead, the vertical dimension of the taxonomies was collapsed, leaving 118 category names that were obtained from the 20 respondents during the interviews. Many of these names were very similar (e.g., "Large," "Big Guys," "Big Firms," etc.) and the 118 were reduced to 37 by combining names that had identical meanings. The 37 resulting category names with their respective frequencies are reproduced in Appendix B.

Although these 37 labels represent the words respondents used to categorize organizational forms in the industry, it was clear during the interviews that different respondents were using different words to label the same category of firms. For example, the mental model of most respondents included a group of large firms in the southern Borders area of the country. Some respondents labeled this group with their location, some with their knitting technology, some with their size, and still others with a broader label such as "industrial" that considers several characteristics of the group simultaneously. To some extent, these differing labels are to be expected since the cognitive ordering of firms in the industry has historically been more implicit than formal and codified. One would expect some variation in the labeling of the correlated attributes that make up a perceived organizational form. The interview results suggest that respondents were simply using different elements of the attribute ensembles to label respective categories. We dealt with this variation by enlisting the help of our industry informants who worked with us to develop a more reduced list of organizational categories that summarized the gist of the interview results. The reduced list consisted of seven distinct categories of firms in the industry. The seven categories are included in Appendix B. This seven category mental model represents a tentative cognitive ordering that we sought to verify and examine more closely using an industry-wide questionnaire.

Industry Questionnaire

Consistent with our expectations that organizational categorizations are based upon technical attributes, many of the technical dimensions in Figure 3 appear in the cognitive taxonomies elicited from the same respondents. This is prima facie evidence that ensembles of technical attributes are a major element in the categorization process. At the same time, however, the taxonomies also reveal that geographic location and size are two additional non-technical attributes that are used to describe organizational variation. Indeed, size and location are the most frequently used category labels (see Appendix B). Thus, the interview data suggest that attribute combinations of size, location, and 11 technical dimensions are the basis for the cognitive ordering of firms within the industry. A questionnaire was designed to obtain attribute descriptions, categorizations, and competitive referents from managers of the 262 firms on the industry master list.

The questionnaire consisted of four sections. Section One requested information about the respondent's (a) current job title, (b) tenure in the industry, organization, and present position, (c) functional history, (d) place of birth, (e) industry employment history (f) gender, and (g) major activities performed on the job. In Section Two managers provided (a) the number of full-time, part-time, outworker, and government-funded workers their firm employed, and (b) total sales for the most recent full year of operations using 11 categories of revenue amounts from "£50,000 or less," to "over £40 million." Section Three asked the respondents to rate their firm on all the alternatives for the 10 technical dimensions other than employee type (which was obtained in Section Two) appearing in Figure 3. For the 10 dimensions, there were a total of 75 specific attribute scales. Each of the 10 dimensions was listed in large letters, followed by the technical variations for that dimension in smaller print. Next to each variant was a 5-point rating scale. The rating

scale consisted of the following numerical options: 1 = "has not been a part of our business at all," 2 = "has been a small part of our business (less than 5% of our sales)," 3 = "has been a moderate part of our business (5-15% of our sales)," 4 = "has been a large part of our business (16-30% of our sales)," 5 = "has been a very large part of our business (over 30% of our sales)." Using percentage of sales as the underlying descriptor is consistent with the norms of the industry. The percentage definitions of the small, medium, large, and very large adjectives is also consistent with industry norms. Both of these definitions were validated by our industry informants. Respondents were asked to make their ratings using only the last 18 months of operation. At the end of Section Three, respondents were also asked to rate the extent to which their firm fit within each of the seven categories listed in Appendix B that were hypothesized to be the cognitive ordering of the industry. Each category was listed on the questionnaire followed by a 5-point rating scale. For each category, respondents were asked to note whether their firm "does not fit within this category at all," or fits within this category "slightly," "moderately well," "well," or "very well." Finally, Section Four presented managers with a list of all 262 firms on the master list. They were asked to examine the list and place a checkmark next to all those companies that they considered competitors and who they often considered during the past 18 months when setting prices, developing products, and marketing their knitwear. In addition, respondents were asked to provide the names of any Scottish knitwear companies, UK knitwear companies, and foreign knitwear companies that fit the above definition but who were not included on the original list of 262 firms.

Questionnaire Justification

Our arguments about competitive comparisons are based upon the assumption that managers use both self and other attribute beliefs and categorizations to select competitive

referents. The greater the perceived difference between self and other attributes, the less likely the other firm will be selected as a competitive referent. Ideally, then, it would be desirable to have managers describe both their own firm and every other firm on each dimension used in the categorizations. Differences in self and other ratings could then be used to predict referent choices. In the present case, however, more than 80 meaningful attribute alternatives across many different dimensioins were obtained from the interviews. Having each manager rate his/her own firm and the other 262 firms in the industry would require the respondent to make over 20,000 judgments to complete the questionnaire. Clearly this is not feasible given the available managerial time for completing any outside survey. To overcome this problem, one can reduce the number of attributes, reduce the number of firms, or limit the ratings to the self category with the assumption that self-other comparisons are implicitly being made when selecting referents.

We chose the last strategy as the least problematic compromise. Reducing the number of attributes was not feasible since a major purpose of the study was to determine which attributes are used more heavily in categorizing firms in the industry. Any a priori limitation on the range of attributes listed on the questionnaire would make specification error more likely. Similarly, reducing the number of other companies that respondents were asked to describe was also not feasible since any sampling scheme would seriously complicate analyses of the referent network. For these reasons, we chose to include only self attribute descriptions in the questionnaire and to use differences in self ratings across firms as a proxy for actual self-other comparisons. To illustrate, consider the case of two hypothetical firms A and B. Ideally, managers from A and B would describe both A and B on a set of attributes, and the perceived differences between A and B could be computed from the perspective of each manager. Since obtaining such comparisons within managers

was not possible, we use differences in the self ratings of A and B managers to compute perceived differences between the firms. This analytic strategy is justifiable if it can be assumed that A's manager knows enough about B to have a perception of B that is positively related to that of B's own manager (and, of course, vice versa). Given the availability of firm specific information in the industry, this assumption seems plausible. Nevertheless, we will present a post hoc test of this plausibility for a randomly selected subset of firms in our sample.

RESULTS

Sample Characteristics

Of the 262 questionnaires mailed to firms on the industry master list, 92 were returned and 89 had useable data, an effective yield of 34%. Since most attribute information on the other 173 firms is not publically available, it is difficult to determine whether the 89 firms in our sample are representative of the master list as a whole. However, one attribute that is known for all firms is location. Since our interview data and our results below both suggest a strong locational effect on attribute descriptions, it is possible to estimate representativeness by testing whether the sample is locationally biased when compared to the 173 non-respondent firms. To conduct such a test, each of the 262 firms on the master list was coded for location using individual latitude and longitude coordinates for the firm's known mailing address. If a sample bias exists, average latitude and longitude for the 89 sampled firms should differ from the average latitude and longitude for non-respondent firms. However, student t-tests on the respective averages reveal no such bias ($t < 1.0$ for both tests). Although this is an imperfect test of representativeness, it is nonetheless consistent with the assumption that the sample reflects the full range of organizational variation on the master list. This

conclusion is further supported by the fact that our sample contains the smallest firms in the industry (sales of under £50,000 and only 1employee) as well as the firm recognized by all experts as the industry's largest (sales over £40 m and 3500 employees). The competitive referents checkmarked by the respondents also provide information about sample representativeness. Across all respondents, only 5 additional Scottish knitwear firms, 14 non-Scottish UK firms, and 6 foreign firms were added to the master referent list included in the questionnaire. These data suggest that the 262 firms on the original list constitute almost the entire known population of Scottish firms. To the extent that the sample is representative of these 262 firms, it is representative of the industry as a whole.

Two-thirds of the respondents are male. At the time of the study, 85% had the job title of Owner or Managing Director of the company. The remaining 15% had titles of Production Director, Marketing Director, or Finance Director. On average, respondents had spent approximately 8 years in their current position, 11 years with their present company, and 18 years in the knitwear industry. Two-thirds were born in Scotland, and another 22% were born outside of Scotland but within the UK. Most respondents had experience in sales and production functions in the knitwear industry, and approximately 20% had experience in retailing. On average, respondents were directly involved at least once or twice a month in monitoring quality, setting prices, making sales contacts, scheduling production, purchasing yarn, and developing and/or approving knitwear designs. Few respondents used formal market research to monitor customer trends. Respondents typically acquired market information from retailers, suppliers, sales agents and other employees in their company. In addition, market information was obtained a few times per year from trade associations, trade fairs, government publications, and design consultants. The companies represented in the sample averaged 32 years of operation, with a range

from 94 to 2 years of age. The companies averaged £250,00 to £500,00 in sales, and had, on average, 71 full-time and 8 part-time employees along with 71 outworkers.

Missing Data and Questionnaire Validation

Analyses of missing data suggest that non-responses are non-randomly distributed across items. However, no item has greater than 13.5% missing data, and the highest non-response rates are for demographic items requesting information about professional and/or personal backgrounds. Since this information is not of primary interest in the research, the non-responses are inconsequential. Of the key organizational attribute items, only the "Gauge" dimension has significant missing data (10% on all gauge alternatives). The pattern of responses suggests that some respondents had difficulty describing the gauge of their knitwear, either because they were not informed of the calibration of their knitting equipment, or because of non-standard gauges that were not available as alternatives in the questionnaire. However, because gauge items were completed by 90% of the sample, and because the pattern of missing data on these items does not reveal a sizeable bias toward any single type of firm, we retained the gauge dimension in our analyses. In the end, gauge descriptions do not play an important role in the pattern of obtained results. Missing data on items other than gauge descriptions are almost non-existent and distributed across the sample in an apparently random pattern. Thus, no items are excluded from our analyses. N's for all statistics, together with any controls for missing data, are reported when appropriate.

Each respondent's ratings of his/her firm is essentially a global description of the firm on key attribute dimensions. To the extent that this description is not simply a momentary response to questionnaire demand characteristics, it can be considered a stable "schema" of attribute beliefs about the firm. Stability in self perceptions is important

given the assumed role of an underlying business definition in the social construction of competitive boundaries. Although the design of the present study is cross-sectional, it is possible to estimate the degree of stability in the attribute beliefs of firms by comparing the questionnaire descriptions with self descriptions on the same attributes obtained in a different context (e.g., Ozer, 1986). To do this, we used the most recent editions of the Buyer's Guide to Scottish Knitwear, the Scottish Borders Knitwear Buyer's Guide, and the ICC Financial Survey of the Scottish Knitwear Industry to develop an alternative profile of listed companies on certain technical attributes and size. The first two sources are published by industry associations to provide potential buyers with information about the product characteristics of member firms. Certain attribute dimensions such as gauge, knittiing methods, product styles, and product categories are listed for each firm. These sources are incomplete, however, because not all technical dimensions are listed for each firm, and only 26 of the firms in our sample appear in the listings. Moreover, the buyer guides are more general than our questionnaire because they focus upon production capabilities rather than actual sales figures. Nonetheless, we coded attribute descriptions on the buyer guides for the degree to which they corresponded with questionnaire descriptions on the same attributes. Of the attributes listed in the buyer guides, 79% are also rated at least a "2" on the corresponding questionnaire alternative. The Financial Survey was used to examine the stability of size ratings. The Survey included recent annual sales for 16 of the firms in our sample. The published sales data correlate .89 with the sales ratings on the questionnaires for these 16 firms. Thus, although incomplete, these comparative data are consistent with the assumption that the self descriptions on our questionnaire reflect relatively stable self schemas.

Finally, we tested the extent to which respondent's perceptions of competitor

attributes were consistent with the competitor's self perceptions. As noted previously, using differences between managerial self perceptions as a proxy for perceived differences among firms within managers is justifiable only to the extent that managerial knowledge of competitors corresponds to that of the competitors themselves. Perfect correspondence is not necessary, only a positive linear association between the beliefs that A has of B and B of himself/herself. Sixty-one of the 89 respondents had one or more competitive referents among the other 88 respondent firms. To test correspondence, we took six of these firms (a 10% random sample) and randomly selected one competitive referent for each as a judgmental standard. We phoned each of the six test firms and asked the manager who responded to our self questionnaire to rate the selected competitive referent on the same questionnaire items. Since the selected referent was among the 89 firms in our sample, we were able to compare the test manager's ratings of the competitor to the same ratings obtained from the competitor's own manager. For each of the six test cases, we computed a Kendall's coefficient of concordance between the test manager's ratings of the competitor and the competitor's own self ratings. The coefficients are above .80 for all six cases, suggesting that a strong positive association exists between the two sets of beliefs. These data support the assumption that common knowledge of firms exists within the industry.

Categorizations and their Attribute Structure

Questions 1 and 2 concern the number and internal structure of accepted organizational categorizations in the industry. We address these questions simultaneously by using the descriptions of the technical dimensions, sales ratings, and location latitudes and longitudes to validate the hypothesized 7-category ordering and to isolate the attribute structure of each validated category. First, we identify the attribute dimensions that have

high diagnosticity within the entire set of attribute ratings. We examine whether highly diagnostic attributes are most related to the hypothesized cognitive ordering of firms. We then use cluster analysis on the diagnostic attributes to parse the 89 respondent descriptions into non-overlapping sets of firms with similar attribute patterns. Next, we use correlational techniques to map various cluster solutions onto the obtained category ratings to determine which cluster solution best fits the perceived category membership. Once we establish the best fitting solution, we test differences in mean attribute descriptions across the obtained categories of firms.

Attribute diagnosticity. The ten technical dimensions combined for a total of 75 specific attribute ratings on 5-point scales: knitting methods (4), yarn fibers (10), yarn dyeing (3), assembly methods (4), product styles (3), knitting gauges (14), customer markets (3), product categories (18), order types (4), and selling/distribution methods (12). The employee dimension enumerated four types of employees, and location had one score for longitude and one for latitude. Sales were indicated using a single rating on an 11-point scale. Thus, a total of 82 attribute variables across 13 different dimensions comprised the core of the analysis. To simplify the interpretation of the data, we defined diagnosticity at the dimensional level rather than at the level of each attribute variant. Any single dimension was considered highly diagnostic to the extent that its attribute variants on average, were highly correlated (positively or negatively) with the alternatives for the other 12 dimensions. Thus, for each dimension, a "diagnosticity score" was computed as:

$$D=\frac{\sum_{i=1}^{N_k}\sum_{j=1}^{M-N_k}|r_{ij}|}{N_k(M-N_k)}$$

where N_k = the number of variants in attribute dimension k, M = 82, and r_{ij} = the

correlation between the ith variant on the kth dimension and the jth variant on a dimension other than the kth. In short, D is the average absolute correlation between all variations for a given dimension and the other M-N_k variations for the other 12 dimensions. A high D score means that an attribute dimension's variants are, on average, highly correlated with the variants of other dimensions and are thus central to the correlational structure of the perceived attribute space in the industry. The D scores for all 13 attribute dimensions are presented in Table 1. Sales has the highest diagnosticity with an average absolute correlation of .25, product type has the lowest (.11).

---

insert Table 1 about here

Attribute Diagnosticity and Categorizations. To examine the relationship between attribute diagnosticity and categorizations, a category relatedness score C was computed to assess how closely a given attribute dimension correlated with respondent ratings on the seven industry categories. C was defined for a given dimension as:

$$C = \frac{\sum_{i=1}^{N_k} \sum_{j=1}^{M} |r_{ij}|}{N_k M}$$

where N_k is the number of attribute variants within the kth dimension, M = 7, and r_{ij} = the correlation between the ith variant on the kth dimension and the jth industry category. A high C indicates that a given dimension's variants , on average, are highly correlated (again, positively or negatively) with the seven industry categories. A high average correlation suggests that an attribute dimension is used more heavily by respondents in categorizing firms in the industry. The second column of Table 1 presents the C scores for each of the 13 dimensions. Knitting methods (.34) and sales (.32) have the strongest

relationships with categorizations, while product type (.11) has the weakest. Table 1 shows that D and C are highly correlated ($r = .82$, $p < .01$). Thus, attribute dimensions that are the most intercorrelated with other dimensions also have the the strongest relationships with the seven category ratings. Organizational categorizations seem to coalesce around diagnostic attribute dimensions.

Cluster Analysis, Diagnosticity, and Category Validation. The above analyses show that dimensional diagnosticity is related to ratings of category membership for the seven pre-defined categories. Cluster analysis was used to test whether these seven categories best fit the attribute patterns or, if not, to determine what categorical structure is optimal. The 82 raw attribute scores were standardized with means of zero and standard deviations of one. Missing data were set to mean values on the appropriate variables. Cluster analyses using Ward's algorithm (e.g., Lorr, 1983) were performed on various subsets of the 82 attribute alternatives. Ward's method is agglomerative, hierarchical, and non-overlapping. Clusters are formed by calculating a mean for a cluster and then computing the squared Euclidian distance to that cluster mean for each case. The clusters that are combined are those resulting in the smallest increase in the overall sum of the squared within-cluster distances.

There is no recognized best method for determining an optimal cluster solution. Milligan and Cooper (1985) examine thirty different criteria for determining the number of clusters within a dataset and conclude that each criterion has strengths and weaknesses. One method that performed well in Milligan and Cooper's simulation study computes correlations between the raw distance matrix used to form clusters and a series of "structure matrices" that correspond to various numbers of clusters extracted from the data. A structure matrix is a binary square symmetric matrix with rows and columns

representing cases. A cell in the matrix is scored "1" if two cases are within the same cluster, "0" otherwise. The cluster solution whose structure matrix has the highest correlation with the original distance matrix is, by this criterion, the best fitting solution.

We adapted this method to examine how well the attribute data fit the hypothesized 7-category cognitive ordering. First, we derived a criterion distance matrix by summing the squared Euclidian distance for each pair of cases on the 7 category ratings (i.e., $\Sigma(X_i-Y_i)^2$, where X and Y are scores on the ith category scale for respondents X and Y). Next, we selected three different subsets of the 82 attribute variables: (a) the full set of 82 variables for the 13 attribute dimensions, (b) a reduced set consisting of the 14 attribute variables for only those 5 dimensions having significant relationships with the categorizations using a C score cutoff of .21 ($p<.05$, $df = 87$)--sales, knitting methods, assembly methods, location, and product styles, and (c) the residual set of 68 variables from the 8 attribute dimensions with low C scores. Third, we used Ward's algorithm to form hierarchical clusters for each of these sets of variables and extracted 5 structure matrices for the 4-, 5-, 6-, 7-, and 8-cluster solutions for each set. We then used Hubert and Shultz's (1976) "quadratic assignment procedure" to calculate correlations between each structure matrix and the criterion distance matrix computed from the category ratings. QAP permits comparisons to be made between two matrices while taking into account the inherent dependencies of the cells in each matrix (e.g., Krackhardt, 1987). A correlation is computed between the respective cells of the two matrices and then the significance of this correlation is tested using random permutations of the predictor matrix to estimate the chance probability of the obtained r-value.

Table 2 provides the 15 correlations computed for the three different sets of attribute dimensions and five different cluster solutions. The negative correlations for the

full set of dimensions are all statistically reliable at conventional levels. However, Table 2

---

insert Table 2 about here

---

reveals that when this set of 13 dimensions is segregated into 5 highly diagnostic and 8 non-diagnostic dimensions, only the dimensions with higher C scores are related to the category distance matrix to a statistically reliable degree. Indeed, the magnitudes of the diagnostic correlations are almost twice those of the full attribute set. Once the diagnostic dimensions are removed from the analysis, the correlations for the residual dimensions drop to almost zero. These data reinforce the argument that the category ratings reflect diagnostic rather than non-diagnostic attribute dimensions. Apparently, sales, assembly methods, knitting methods, location, and product styles form an attribute ensemble that is the best predictor of the category profile of individual respondents.

Applying Milligan and Cooper's (1985) maximum correlation criterion to the results for the diagnostic attributes suggests that a 6-cluster Ward's solution fits the category distance matrix slightly better than a 7-cluster solution (see the second row of Table 2). To obtain a more detailed profile of the category ratings for these six clusters, cases were assigned to their appropriate cluster group and the means and standard deviations for the seven original categories were computed for each cluster. These results are presented in Table 3. Since Bartlett tests revealed that the variances of category ratings were unequal

---

insert Table 3 about here

---

across the six groups, standard MANOVA and ANOVA analyses were not possible. Kruskal-Wallis tests were performed on each of the seven category ratings individually, setting α at .05/7 or .007. The resulting chi-square statistics, corrected for ties, also

appear in Table 3. Even with a conservative control for error rate, the magnitudes of the seven chi-squares are sufficient to reject the null hypothesis that the groups are perceived to fall in the same category. Duncan multiple range analyses (α = .05) on the six means for each category rating tested the magnitude of pairwise differences. Table 3 shows a clear pattern of results. Cluster 1 respondents rated their firms as fitting the "handframe designer" category more closely than other respondents, Cluster 3 managers categorized their firms as "handframe traditional," and Cluster 4 respondents categorized their firms into the "upmarket fully fashioned" category. Rather than distinct designer and traditional categories appearing among "handknitters," Cluster 2 managers scored high on both. Although Cluster 2 managers see their firms as more designer than traditional, apparently "handknitters" differentiate between product styles less than between knitting methods. Clusters 5 and 6 score high on both "middle market" and "mass market" categories, although Cluster 5 managers appear to have a broader view of their firms in the sense that they rate their firms slightly higher on the "upmarket," "handframe designer," and "handframe traditional" scales.

These differences are reinforced by examining the cluster attribute profiles. Table 4 provides the means and standard deviations for the 14 diagnostic attribute ratings for each

---

insert Table 4 about here

---

of the six cluster groups. The columns of Table 4 can be considered group self schemas representing the average attribute descriptions of each managerial cluster. Again, homogeneity tests ruled out F statistics, but Kruskal-Wallis analyses (α = .05/14 = .003) reveal significant group differences on all 14 attributes. Table 5 contains a narrative summary of each group's attribute schema derived by substituting the scale labels on the

attribute ratings for the numerical means. The six groups clearly have different self perceptions and geographic centers. We consider this modified 6-group cognitive ordering

---

insert Table 5 about here

---

to be the best description of the cognitive structure of the industry.

Categorizations and Competitive Boundaries.

The above analyses isolated six perceived organizational forms in the industry, each with a particular locational center of gravity. Question 3 pertains to whether this cognitive ordering is associated with the network of competitive referents among firms. That is, are firms in the same cognitive group more likely to use each other as competitive referents than firms in different cognitive groups? This is essentially a question about differential densities of competitive ties. If firms within the same cognitive category perceive each other as competitors and use each other as referents, the densities of referent ties within groups should be greater than the densities between groups. This question was addressed using the network of competitive relationships obtained in Section Four of the questionnaire.

Defining the Focal Competitive Network. For purposes of the present research, we defined the focal competitive network as the square matrix of referent ties among the 89 firms in our sample. Each respondent was asked to check which of the other 261 firms in the industry they used as referents in their pricing and product decisions. They were also asked to note any referents not on the list either within or outside the country. Since very few non-listed firms were mentioned, we ignore them in our analyses. Of the listed firms, 89 were part of our sample, and 173 were not. Respondents cite a total of 299 referent ties to the 88 other firms in our sample (on average, 3.33 per respondent) and 328 ties to

firms that did not respond to the questionnaire (on average, 3.68 per respondent). We define density as the total number of actual referent ties divided by the total number of possible ties. Using this definition, the density of referent ties is .038 for other firms in the sample and .020 for firms not in the sample. However, since we are interested in assessing the relationship between self categorizations and the structure of competitive referents, ties to non-respondent firms cannot be usefully analyzed because the self categorizations for non-respondents are not known. Thus, we focus our analysis on the binary square 89 X 89 referent matrix of firms for which we have complete data. A cell in this matrix is coded "1" when the row firm cited the column firm as a competitive referent, "0" otherwise.

Categorizations and Referent Ties. The 89 X 89 referent matrix, permuted so that members of the same cognitive group are adjacent to one another, is reproduced in Appendix C. Table 6 displays the image matrix of within and between group densities. The principal diagonal of Table 6 shows within group densities, the off-diagonal entries show directional between group densities. For all six cognitive groups, within densities are higher than between densities. Indeed, in no groups are within densities less than 85% higher than between densities. To obtain an assessment of the relationship between group structure and referent densities, a QAP correlation was computed between the focal referent matrix and a structure matrix representing the six clusters of respondents. The resulting correlation of .30 is highly significant ($p < .001$) based upon 2000 random permutations of the structure matrix. For comparative purposes, similar QAP correlations were computed using 4-, 5-, 6-, 7-, and 8- cluster structure matrices for the full set and residual set of attributes. None of the resulting correlations are as high as the six cluster structure matrix based upon the diagnostic attributes. The highest correlation obtained

was .22 for the 7-cluster full set of attributes. Thus, clusters based on the diagnostic attributes have the highest correlation with the referent matrix. The six category cognitive ordering of the industry is clearly reflected in the structure of competitive ties among member firms.

DISCUSSION

Six competitive groups, labeled with the industry's own nomenclature, were isolated using comparative cluster analyses. Each group is characterized by a distinct profile of attribute self descriptions. All attribute descriptions, however, are not equally important for self categorizations. The results suggest that of the 82 attribute variables describing individual firms, only a reduced subset of 14 variants of five attribute dimensions at the correlational center of the attribute structure are associated with perceived category membership. The results also suggest that the obtained 6-group cognitive ordering is related to the pattern of competitive referents in the industry. Competitive ties within each cognitive group are at least twice as dense (sometimes denser) than ties between cognitive groups. Apparently, a strong bias exists within the industry to focus competitive interactions on similar rather than dissimilar firms.

Problematic Features of the Study and Additional Interpretations of the Results

Before discussing the implications of these results, it is important to address some of the ambiguities inherent in the data. First of all, the segmentation of attribute dimensions into high and low diagnostic groups must be viewed somewhat cautiously. Our ethnographic research has convinced us that a small set of attribute beliefs forms the foundation for the cognitive ordering of the industry. Firms are different in hundreds of perceptually discriminable ways. Only a subset of these differences are salient enough to become conventionalized elements in the space of attribute dimensions depicted in Figure

3. Appendix B reveals that even this list is too inclusive, and that yet another more limited subset of attributes forms the basis for the categorical knowledge of knitwear managers. A major reason for conducting the questionnaire study was to test various attribute combinations for their ability to explain differences in perceived category membership and competitive referents. The difficulty of choosing attributes for cluster analysis is a well-known problem (e.g., Fowlkes, Gnanadesikan, & Kettering, 1988). As one selection criterion, attribute diagnosticity is theoretically justified on the basis of cognitive theory and research. Our operationalization of diagnosticity (i.e., average absolute correlation) seems consistent with how diagnosticity has been conceptualized in basic research on cognitive categorization (e.g., Rosch, 1978). At the same time, however, Table 1 reveals that the range of D and C scores is quite low, and that no clear breakpoint exists in the two distributions. Our segmentation is somewhat arbitrary, although it is informed by our understanding of the industry as well as the category labels obtained in Appendix B. Of the 15 category labels in Appendix B with frequencies greater than 1, 14 are captured by the five "diagnostic" dimensions that we defined in the study. We tested the robustness of this segmentation by using different combinations of attributes, and by using other segmentation rules (e.g., taking the difference between the highest and lowest scores and dividing by 2). It is our opinion that the first five attribute dimensions of Table 1 provide the best fitting cluster solution for both category ratings and competitive referents. Moreover, it is our interpretation of the data that these five dimensions act <u>jointly</u> rather than individually to influence categorizations. Thus, all five dimensions are necessary, and none are sufficient in themselves, to explain the cognitive ordering of the industry. We feel that the fact that these five dimensions are also the highest in diagnosticity and category relatedness is not simply coincidental.

This interpretation of the data implies that one factor that explains why some organizational attributes become the basis for competitive interactions in the industry is attribute diagnosticity. There are other possible explanations. For example, one could argue that the cluster fit of the top five dimensions in Table 1 is simply due to common method variance in the questionnaire procedure. Many of the words used to label the seven original categories in the questionnaire were also used to frame the attribute variables. Thus, "handknitting" is one type of knitting method, but it is also a category of firms as well. Perhaps the best fitting cluster solution simply reflects redundancies in the wording of the questionnaire rather than something fundamental about the cognitive ordering of the industry. This explanation seems implausible, however, because some of the five diagnostic dimensions (e.g., sales, location, and assembly methods) do not appear in the category labels used in the questionnaire, and other dimensions that do appear (e.g., order type, markets served) are not highly related to organizational categorizations. Alternatively, one could argue that these five dimensions are important to retailing customers and consumers in the choice of knitwear products. This interpretation of the data would imply that cognitive categorizations and competitive interactions coalesce around dimensions that are important to customers. However, our understanding of the industry leads us to reject this possibilty since some of the five dimensions have very little customer relevance (e.g., location and size), while dimensions that are commonly understood as playing a major role in attracting customers (e.g., order types and gauge) are unimportant in the best fitting cluster solution. In the end, diagnosticity seems the most plausible explanation for the obtained pattern of results.

The plausibility of diagnosticity becomes even more apparent when one considers the entire enactment cycle portrayed in Figure 2. Since we did not measure the strategic

choices and activities of the organizations in our sample, our research is necessarily limited to explicating the top right section of the Figure. However, if attribute beliefs, categorizations, and self-other comparisons have any utility for the managers involved, these cognitive processes must bear some relationship to actual organizational activities. In this regard, attribute diagnosticity should reflect the correlational structure of activities and assets in the industry. Our understanding of the technical logic of knitwear production leads us to believe that this is indeed the case. The choice of knitting and assembly methods dictates much of the identity of a firm. Handknitting and handframe knitting constrain the organization to small scale, almost custom, production using heavy gauge knit structures. Typically, production is subcontracted to outworkers in order to minimize the fixed costs of physical assets. In addition, such firms subcontract their distribution to non-exclusive agents and buying houses who act as representatives for groups of such firms simultaneously. On the other hand, fully fashioned and cut and sew automatic knitting reduces the hand content in the manufacturing process, and thus allows for economical mass production. Mass production brings with it the need for full-time factory labor and dedicated sales personnel. Moreover, since automatic machines are more precise than hand methods, finer gauge knit structures are possible, thereby influencing the type and style of garment that can be produced. In light of these technical considerations, the importance of size, knitting and assembly methods, and product styles in the cognitive ordering of the industry is not surprising.

The important role of geographic location in shaping competitive boundaries appears to be a result of both chance historical events and the resource endowments of particular regions of the country. Locational effects provide useful clues concerning how the industry enactment process has resulted in a six cluster cognitive ordering over time.

According to Gulvin's (1984) detailed historical study of the industry, the Shetland Islands and the Borders region were the two points of entry for knitting technology into Scottish territory. Shetlanders seem to have been influenced by garments worn by Portugese sailors shipwrecked on the Islands during the 16th Century. An indigenous handknitting expertise developed to replicate this style of knitting, and today 2,000 of the 16,000 inhabitants of the Islands are hand- or handframe knitters producing garments with a distinctive "traditional style" that is recognized around the world. The Island style has been copied by other small knitters on Orkney and the Western Islands of Arran and Skye. These latter handknitters, however, have updated the style to a more modern "designer" format to differentiate their garments from traditional Shetland producers. In contrast, the Borders tradition began in the 17th Century in Edinburgh with handframe knitting. Knitters moved south into the Borders to take advantage of local resources for sheepherding, and eventually large scale factory production using automatic machinery replaced the handframe as the major knitting technology. The Borders town of Hawick became the center of knitwear production, and the largest firms in the industry are located in and around the Roxburghshire area. Many of these firms got their start by knitting very fine gauge undergarments and hosiery, and transferred these skills to expensive cashmere and lambswool pullovers and cardigans after World War II. In Edinburgh, vestiges of handframe technology remain, with a group of small "high fashion designer" knittters producing for their own label, sometimes for their own shops in the city, and selling to tourists travelling in the country. These designer knitters eschew large scale production, and consider themselves to be the creative innovators in the industry. Finally, two groups of firms to the west of the Borders region constititute the "middle market niche" and "mass market contract" cognitive groups. According to Gulvin, Western firms migrated

from the Borders to escape the high labor costs of the Hawick trade unions. In doing so, these firms began to differentiate themselves from Hawick producers by manufacturing cheaper knitwear of lesser quality. Middle market firms use a combination of technologies to produce their distinctive "value for the money" specialty products, while mass producers rely almost exclusively on less costly cut and sew and overlocking methods to produce "cheap and cheerful" products sold through chain retailers in the UK.

The historical evolution of this industry raises important questions about the relative advantages of diachronic versus synchronic analyses of an industry's cognitive structure. Over the 300 years of the industry's existence, there has apparently been a gradual differentiation of organizational forms into a competitive field that now consists of six recognized types. Our cross-sectional research cannot meaningfully answer questions about the etiology of the industry's modern cognitive structure. Synchronic analysis can only determine what ordering now exists and whether it is associated with a particular pattern of competitive comparisons in the industry. To understand the details of the industry's enactment over time, it would be necessary to conduct a diachronic analysis of how mental models and activity patterns reciprocally influenced each other over time to create the current differentiated cognitive ordering. This does not, however, mean that synchronic analysis is unimportant. First, historical mappings of cognitive structures are likely to prove difficult because archival measures indexing the cognitive content of an industry are indirect at best. What diachronic analysis gains in explanatory power is balanced by more noisy cognitive data. Second, synchronic analysis of social systems is justified to the extent that one can assume that the system has reached a relatively stable equilibrium position (e.g., Lieberson, 1985; Tuma & Hannan, 1984). The very purpose of studying industry cognitive structures rests upon the assumption that such orderings

constitute a stable interpretive backbone for managerial sensemaking. In the case of Scottish knitwear, there is nothing apparent in the history of the industry to suggest that the the cognitive ordering of organizational forms has been volatile and dynamic. Indeed, historical accounts portray a very slow moving industry that has enacted a differentiated competitive space only gradually over the course of 300 years. Finally, the existing cognitive ordering is clearly important for understanding contemporary competitive dynamics. Organizational competition occurs in real time, and the managerial sensemaking behind pricing, output, and product designs must draw from the cognitive ordering that exists at the moment of strategy formulation. There is no good theory to aid in the choice of an appropriate unit of "competitive time." Long-wave studies of competitive evolution may be helpful in explaining collective dynamics over the course of the knitwear industry's history. However, it is reasonable to assume that contemporary competition is influenced by the collective wisdom of the industry as it exists today. For managers, the origins of this wisdom are relatively unimportant.

Conclusions and Implications

DiMaggio and Powell (1991) note that the study of organizational fields has recently taken a "cognitive turn" by emphasizing the socially contructed nature of interorganizational relationships. However, this growing literature has lacked adequate "micro-translations" (Collins, 1981) explicating the social psychological underpinnings of interorganizational belief systems. Beginning with the sensemaking needs of managerial strategists, the present research attempted to uncover the micro cognitive substrates of one competitive field. In doing so, our goal was to show the applicability of cognitive theories of categorization for macro competitive phenomena that heretofore have eluded social psychological analysis. The competitive network presented in Appendix C is clearly

non-random. That this network maps onto the six cognitive groups obtained from the questionnaires is sound evidence that self-other competitive comparisons are intertwined with a collective belief system that discriminates among perceived organizational forms. To the extent that competitive comparisons are enacted in strategies and organizational resource allocations over time, it is justified to conclude that this collective cognitive ordering is embedded within the material structures of the industry as well. In this way, micro cognitive structures have macro collective effects.

This conclusion has relevance for debates about the criteria used to classify organizations into competitive groups. It is very difficult to study organizational competition without making starting assumptions about the location of competitive boundaries. Economists and organizational researchers have typically dealt with this problem by using a number of criteria such as the Standard Industrial Classification, incidental samples derived from available directories and historical archives, and simply commonsense. None of these criteria are without problems (e.g., Nightengale, 1978; Auerbach, 1988; McKelvey, 1982; Barney & Hoskisson, 1990; Day, Shocker, & Srivastava, 1979). A social constructionist approach to boundary definition, however, calls attention to the fact that all such criteria are beliefs about appropriate discriminations among organizations. Indeed, a cognitive analysis of competitive groups suggests that the very meaning of an organizational form is tied to collective beliefs summarizing perceived attribute ensembles in the environment. While such ensembles may have material manifestations, their meaning and relevance to actors stem from shared classifications that have proven useful in making sense of the diversity of organizational forms. Since classifications are contingent upon the actors doing the classifying, any analysis of competition and competitive boundaries must be framed within a particular perspective.

The present research was framed within the supply-side perspective of managerial actors responsible for organizationally critical competitive decisions. This is justified to the extent one might be interested in exploring how managerial categorizations and competitive beliefs intertwine with the strategy formulation process. Alternatively, focusing upon the demand-side perspective of how customers/clients categorize organizations and define competitive boundaries may be justified to the extent that one is interested in exploring buyer behavior (e.g., Day, Shocker, & Srivastava, 1979). Different classificatory perspectives are useful for different theoretical questions.

This cognitive relativism extends to the very definition and operationalization of organizational competition. There can be no disagreement that competition involves "shared fate." However, fate can be conceptualized at many different levels of abstraction. The dominant treatment of this issue in the organizational literature has been offered by organizational ecology. Ecologists typically define competition as occurring when the presence of one organization makes it less likely that another organization will survive (e.g., Hannan & Freeman, 1989). In this way, ecologists reduce the dynamics of rivalry to historically tractable organizational birth and death rates that are then used to infer the level of competitive intensity within and between defined populations of firms. Clearly, this conceptualization of competition is too generic to be entirely useful for a social constructionist approach to markets--that is, an approach that focuses upon the sensemaking processes of actors embedded in an industrial context. A cognitivist approach requires that the situated competitive reasoning of actors be mapped and explained. How actors define and label competitors, how they use these knowledge structures to formulate market strategies, and how they respond to market events as they transpire are the key questions motivating a cognitivist research agenda. In this regard, a

social constructionist approach to markets is much more akin to that of industrial economists, who historically have emphasized the situated decisional structure of competition and the informational foundation for market activities (e.g., Tirole, 1988). However, where economists have been content to make a priori assumptions about the cognitive basis of shared fate, social constructionists are interested in exploring its socio-cognitive properties. The present research demonstrates that even in the highly fragmented competitive environment of Scottish knitwear firms, the social psychology of competition is anything but random and unsystematic.

References

Abell, D.F. (1980). Defining the business: A starting point for strategic planning. Englewood Cliffs, NJ: Prentice-Hall.

Abrahamson, E., & Fombrun, C.J. (1992). Forging the iron cage: Interorganizational networks and the production of macro-culture. Journal of Management Studies, 29, 175-194.

Albert, S., & Whetten, D. (1985). Organizational identity. In L.L. Cummings & B.M. Staw (Eds.), Research in organizational behavior, Vol. 7, 263-295. Greenwich, CT: JAI Press.

Anderson, J.R. (1983). The architecture of cognition. Cambridge, MA.: Harvard University Press.

Arrow, K.J. (1985). Rationality of self and others in an economic system. In R.M. Hogarth & M. Reder (Eds.), Rational choice: The contrast between economics and psychology. Chicago: University of Chicago Press.

Auerbach, P. (1988). Competition: The economics of industrial change. London: Basil

Barney, J.B. & Hoskisson, R.E. (1990). Strategic groups: Untested assertions and research proposals. Managerial and Decision Economics, 11, 1990, 187-198.

Boyer, K.D. (1979). Industry boundaries. In T. Calvani & J. Siegfried (Eds.), Economic analysis and antitrust. Boston: Little, Brown & Co.

Carroll, G.R. (1984). Organizational ecology. Annual review of sociology, 10, 71-93.

Collins, R. (1981). On the micro-foundations of macro-sociology. American Journal of Sociology, 86, 984-1014.

D'Andrade, R. (1989). Cultural models. In M. Posner (Ed.), Foundations of cognitive science. Cambridge, MA: MIT Press.

Daft, R. & Weick, K. E. (1984). Toward a model of organizations as interpretation systems. Academy of Management Reivew, 9, 284-295.

Day, G.S., Shocker, A.D., & Srivastava, R.K. (1979). Customer-oriented approaches to identifying product markets. Journal of Marketing, 43(4), 8-19.

Dickson, P.R. (1992). Toward a general theory of competitive rationality. Journal of Marketing, 56, 69-83.

DiMaggio, P.J. (1982). Cultural entrepreneurship in nineteenth-century Boston, Part II: The classification and framing of American art. Media, Culture, and Society, 4, 33-50.

DiMaggio, P. J. (1991). Constructing an organizational field as a professional project: U.S. art museums, 1920-1940. In Powell, W.W. & DiMaggio, P.J. DiMaggio (Eds.), The new institutionalism in organizational analysis. Chicago: University of Chicago Press.

DiMaggio, P. & Powell, W. W. (1991). Introduction. In W.W. Powell & P. DiMaggio (Eds.), The new institionalism in organizational analysis. Chicago: University of Chicago Press.

Douglas, M. (1986). How institutions think. Syracuse: University of Syracuse Press.

Fombrun, C. (1986). Structural dynamics within and between organizations. Administrative Science Quarterly, 31, 403-421.

Fowlkes, E.B., Gnanadesikan, R., & Kettenring, J.R. (1988). Variable selection in clustering. Journal of Classification, 5, 205-228.

Gulvin, C. (1984). The Scottish hosiery and knitwear industry: 1680-1980. Edinburgh: John Donald Publishers.

Hannan, M. & Freeman, J. (1988). Organizational ecology. Cambridge, MA: Harvard University Press.

Hubert, L.J., & Schultz, J. (1976). Quadratic assignment as a general data analysis strategy. British Journal of Mathematical and Statistical Psychology, 23, 214-226.

Huff, A. S. (1982). Industry influences on strategy reformulation. Strategic Management Journal, 3, 119-131.

Kempton, W. (1978). Category grading and taxonomic relations. American Ethnologist, 5, 44-65.

Krackhardt, D. (1987). QAP partialling as a test of spuriousness. Social Networks, 9, 171-186.

Lakoff, G. (1987). Women, fire, and dangerous things. Chicago: University of Chicago Press.

Lieberson, S. (1985). Making it count: The improvement of social theory and research. Berkeley: University of California Press.

Lorr, M. (1983). Cluster analysis for social scientists. San Francisco: Jossey-Bass.

McGee, J. & Thomas, H. (1986). Strategic groups: A useful linkage between industry structure and strategic management. Strategic Management Journal, 7, 141-160.

McKelvey, B. (1982). Organizational systematics. Berkeley: University of California Press.

Medin, D.L. (1989). Concepts and conceptual structure. American Psychologist, 44, 1469-1481.

Metzger, D.G. & Williams, G.E. (1966). Some procedures and results in the study of native categories: Tzeltal firewood. American Anthropologist, 68, 1966.

Meyer, J.W., Boli, J., & Thomas, G. (1987). Ontology and rationalization in the Western cultural acount. In G. Thomas et al. (Eds.), Institutional structure. Newbury Park, CA: Sage.

Milligan, G.W. & Cooper, M.C. (1985). An examination of procedures for determining the number of clusters in a data set. Psychometrika, 50 (2), 159-179.

Nightengale, J. (1978). On the definition of industry and market. Journal of Industrial Economics, 27, 31-40.

Ozer, D. (1986). Consistency in personality. New York: Springer-Verlag.

Porac, J. & Thomas, H. (1987). Cognitive taxonomies and cognitive systematics. Paper presented at the annual convention of the Academy of Management, New Orleans, LA.

Porac, J. & Thomas, H. (1990). Taxonomic mental models in competitor definition. Academy of Management Review, 15, 224-240.

Porac, J. & Thomas, H. (in press). Cognitive categorization and subjective rivalry among retailers in a small city. Journal of Applied Psychology.

Porac, J., Thomas, H., & Baden-Fuller, C. (1989). Competititve groups as cognitive communities: The case of Scottish knitwear manufacturers. Journal of Management Studies, 26, 397-416.

Powell, W.W. & DiMaggio, P.J. (1991). The new institutionalism in organizational analysis. Chicago: University of Chicago Press.

Rosch, E. (1978). Principles of categorization. In E. Rosch & B. Lloyd (Eds.), Cognition and categorization. Hillsdale, NJ: Lawrence Erlbaum.

Reger, R.K. & Huff, A.S. Strategic groups: A cognitive perspective. Strategic Management Journal, 14, 103-124.

Scott, R. (1992). Institutions and organizations: Attempting a theoretical synthesis. Working paper, Department of Sociology, Stanford University.

Smith, E.E. & Medin, D.L. (1981). Categories and concepts. Cambridge, MA: Harvard University Press.

Smith, E.E. (1889). Induction. In M. Posner (Ed.), Foundations of cognitive science. Cambridge, MA: Harvard University Press.

Spender, J.C. (1990). Industry recipes. London: Basil Blackwell.

Spradley, J.P. (1979). The ethnographic interview. NY: Holt, Rhinehart, & Winston.

Thagard, P. (1992). Conceptual revolutions. Princeton: Princeton University Press.

Tirole, J. (1988). The theory of industrial organization. Cambridge: MIT Press.

Tuma, N.B. & Hannan, M.T. (1984). Social dynamics: Models and methods. Orlando: Academic Press.

Walton, E.J. (1986). Managers' prototypes of financial firms. Journal of Management Studies, 23, 679-698.

White, H.C. (1981). Where do markets come from? American Journal of Sociology, 87, 517-547.

Weick, K. E. (1979). The social psychology of organizing. Reading, MA: Addison-Wesley.

Figure 1

Schematic Summary of the Scottish Knitwear Value Chain

Fiber Producers ---> Spinners ---> Knitwear Firms ---> Distributors ---> Retailers ---> Consumers

Definitions:

1. Fiber producers are sheepherders, goatherders, and chemical manufacturers selling wool, cashmere, fancy fibers such as mohair, and synthetics such as nylon and polyester.

2. Spinners clean, comb, and card fibers and then spin fibers into multifiber yarns.

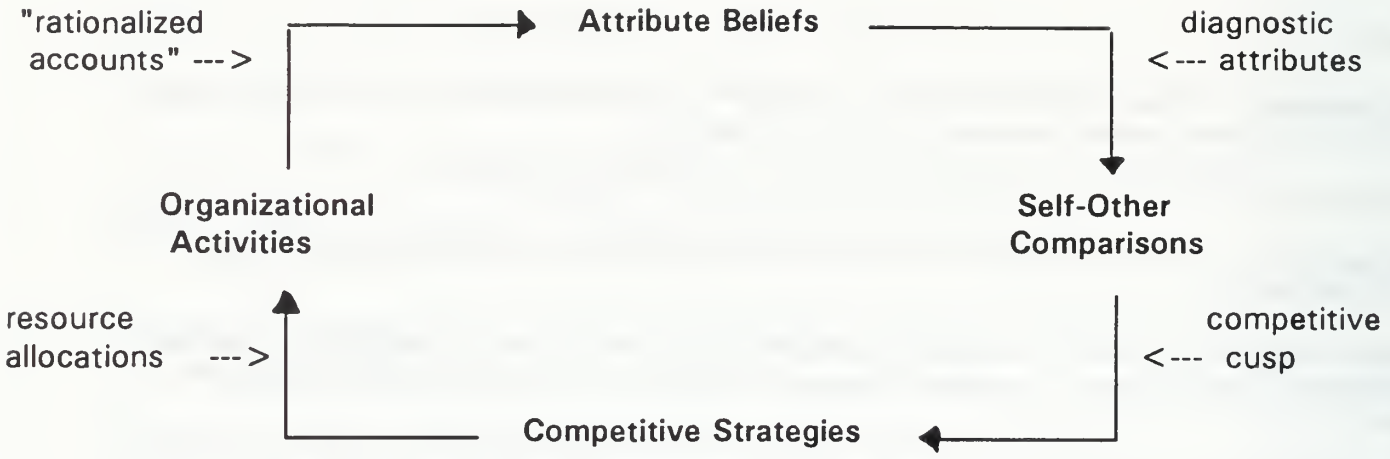
3. Knitwear firms purchase yarn supplies and knit them into various ready-to-wear garments and hose. For more detail, see the text.

4. A variety of distribution channels are used in the industry to link knitwear firms to retailers: company sales personnel, independent agents, wholesalers, company retailing outlets, cooperative buying houses, and mail order.

5. Retailers order knitwear once or twice a year and sell to consumers. Scottish knitwear firms sell to retailers around the world as well as to those within the UK. Retailers range from small independents to large chains.

Figure 2

Enactment Cycle in the Scottish Knitwear Industry



Note: Elements of this enactment cycle are explained in the text.

Figure 3

Salient Technical Dimensions and their Attribute Variants

Inputs

Yarn Dyeing
- Top
- Hank
- Piece

Fibers
- Shetland wool
- Lambswool
- Mohair
- Camel hair
- Synthetics
- Angora
- Blends
- Cashmere
- Cotton
- Silk

Employees
- Part-time
- Full-time
- Outworkers
- Trainees

Transformations

Knitting Method
- Handknitting.
- Handframe
- Fully fashion machine
- Cut and sew machine

Assembly Method
- Handsewiing
- Linking
- Cup seaming
- Overlocking

Knitting Gauge
- 2 1/2
- 3
- 4 1/2
- 5
- 7
- 9
- 10
- 12
- 14
- 15
- 21
- 24
- 30

Outputs

Product Type
- Women's
  - Dresses
  - Pullovers
  - Jackets
  - Suits
  - Hosiery
  - Shirts
  - Accessories
- Men's
  - Pullovers
  - Shirts
  - Jackets
  - Trousers
  - Hosiery
  - Accessories
- Children's
  - Pullovers
  - Hosiery
  - Other clothes
  - Accessories
- Cut and sew blanks

Product Styles
- Traditional
- Classic
- High Fashion

Order Types
- One off
- Company range
- Company stock
- Contract designs

Distribution

Method
- Phone
- Sales dept.
- UK agents
- Foreign agents
- Trade fairs
- Buying house
- Factory shop
- Showroom
- Mail order
- Wholesalers
- Co. retail shops
- Market stalls

Markets

Markets
- UK
- Tourists in UK
- Export

Note: Italicized headings are attribute dimensions. Entries under headings are attribute variants accepted in th industry nomenclature. "Gauge" refers to the number of knitted rows per 1 1/2" of garment. "Knitting methods and "assembly methods" are arranged in the order of less hand labor and more mass production.

Table 1

D and C Scores for Technical Attributes, Location, and Size

Dimension	D	C
Sales	.25	.32
Knitting Method	.18	.34
Assembly Method	.18	.28
Location	.15	.28
Product Style	.15	.22
Fibers	.15	.18
Product Markets	.14	.14
Distribution Method	.14	.15
Employees	.13	.13
Order Types	.12	.17
Knitting Gauge	.12	.13
Yarn Dyeing	.12	.14
Product Type	.11	.12

Note: See text for computational formulas for D and C scores.

Table 2

QAP Correlations Between Cluster Structure Matrices and Category Distance Matrix

Attribute Set	Cluster Solution 4	5	6	7	8
Full Set	-.26	-.26	-.27	-.28	-.28
Diagnostic Set	-.46	-.46	-.49	-.47	-.47
Residual Set	-.02	-.04	-.04	-.01	-.02

Note: Category distance matrix scored so that larger numbers represent greater distances. Negative correlations imply that cases within clusters are less distant than cases not in the same cluster.

Table 3

Mean Category ratings for Six Cluster Groups Derived from Diagnostic Attributes

Category	Cluster Group 1	2	3	4	5	6	χ^2
Trad'l Handknit	1.11[a] (.32)	3.50[c] (1.65)	2.17[b] (1.50)	1.14[a] (.66)	1.00[a] (0.00)	1.00[a] (0.00)	42.45
Design Handknit	1.50[a,b] (1.04)	4.93[c] (.27)	2.06[b] (1.59)	1.24[a] (.77)	1.00[a] (0.00)	1.00[a] (0.00)	52.56
Trad'l Handframe	1.44[a,b] (.78)	1.14[a] (.53)	4.39[c] (1.19)	1.95[b] (1.50)	1.80[a,b] (1.09)	1.00[a] (0.00)	47.74
Design Handframe	4.50[c] (1.20)	1.07[a] (.27)	2.78[b] (1.31)	2.19[b] (.48)	1.80[a,b] (1.09)	1.00[a] (0.00)	48.57
Upmkt Full-Fash	2.11[c] (1.65)	1.29[a,b] (.83)	1.94[b,c] (1.31)	4.86[d] (.48)	1.80[a,b,c] (1.09)	1.00[a] (0.00)	56.38
Midmkt Niche	1.39[a] (1.04)	1.07[a] (.27)	1.00[a] (0.00)	2.14[b] (1.39)	4.20[c] (1.79)	3.69[c] (1.70)	39.23
Massmkt Cntrct	1.00[a] (0.00)	1.00[a] (0.00)	1.06[a] (.24)	1.43[a] (.87)	3.40[b] (1.67)	3.15[b] (1.86)	41.84

Note: Higher numbers indicate better category fit. Numbers in parentheses are SD's. All means with the same superscript are not statistically different at $p < .05$ by Duncan's test. All χ^2s signficant at $p < .007$. N's for the groups are $n_1 = 18$, $n_2 = 14$, $n_3 = 18$, $n_4 = 21$, $n_5 = 5$, $n_6 = 13$. There were no missing data on the category ratings.

Table 4

Mean Ratings on Diagnostic Attribute Variables for Six Cluster Groups

Attribute	Cluster Group 1	2	3	4	5	6	χ^2
Sales	2.06[a] (1.09)	1.36[a] (.81)	1.65[a] (1.06)	5.43[c] (2.34)	6.25[c] (.96)	4.25[b] (2.28)	56.14
Knitting Method							
Handknitting	1.47[a] (.87)	5.00[c] (0.00)	2.77[b] (1.62)	1.19[a] (.51)	1.00[a] (0.00)	1.00[a] (0.00)	45.36
Handframe	5.00[c] (0.00)	1.18[a] (.41)	4.88[c] (.49)	2.57[b] (1.40)	1.00[a] (0.00)	1.00[a] (0.00)	72.01
Full-Fashion	1.00[a] (0.00)	1.00[a] (0.00)	1.24[a] (.56)	4.71[b] (.90)	3.75[b] (1.89)	1.17[a] (.58)	65.62
Cut and Sew	1.71[a] (1.45)	1.09[a] (.30)	1.35[a] (1.06)	1.43[a] (.75)	5.00[b] (0.00)	5.00[b] (0.00)	40.35
Assembly Method							
Handsewing	2.29[a] (1.53)	5.00[c] (0.00)	4.47[b,c] (1.23)	3.67[b] (1.71)	3.00[a,b] (2.31)	1.50[a] (1.17)	40.40
Linking	4.82[c] (.73)	1.00[a] (0.00)	2.88[b] (1.90)	5.00[c] (0.00)	5.00[c] (0.00)	2.17[b] (1.58)	56.85
Cupseaming	1.06[a] (.24)	1.36[a] (1.21)	1.00[a] (0.00)	4.00[b] (1.58)	4.75[b] (.50)	1.00[a] (0.00)	40.88
Overlocking	1.24[a] (.75)	1.18[a] (.41)	1.53[a] (1.33)	2.67[b] (1.56)	5.00[c] (0.00)	5.00[c] (0.00)	55.16
Product Style							
Traditional	1.88[a] (1.17)	3.27[b,c] (1.35)	4.24[c] (1.09)	1.33[a] (.66)	4.00[c] (2.00)	2.50[b] (1.73)	40.16
Classic	1.82[a] (1.33)	1.91[a] (1.22)	3.53[b,c] (1.63)	5.00[c] (0.00)	4.75[c] (.50)	3.08[b] (1.73)	40.75
High Fashion	4.88[b] (.48)	4.64[b] (.67)	3.24[a] (1.60)	3.29[a] (1.15)	4.75[a,b] (.50)	3.42[a] (1.78)	26.59

Table 4 (cont'd)

Location							
North Latitude	55.89[a,b] (.88)	56.49[b] (1.21)	58.56[c] (1.94)	55.67[a] (1.07)	55.41[a,b] (.08)	55.56[a,b] (.33)	35.39
West Longitude	3.31[c] (.83)	4.08[d] (1.11)	1.85[a] (1.04)	2.71[b] (.54)	4.36[d] (.14)	4.09[d] (.38)	50.35

Note: All statistics based upon N = 82, cases for which all variables are non-missing. N's for the groups are $n_1 = 17$, $n_2 = 11$, $n_3 = 17$, $n_4 = 21$, $n_5 = 4$, $n_6 = 12$. Numbers in parentheses are SD's. All χ^2 s significant at $p < .003$.

Table 5

Narrative Summary of the Cluster Groups' Diagnostic Self Perceptions

Cluster Number	Verbal Label and Description
1	"High fashion handframe" firms using hand assembly and linking methods to produce designer knitwear. Sales of around £100,000. Locationally concentrated in Edinburgh.
2	"Handknitters" using hand assembly to produce traditional and designer specialty knitwear. Small, with sales of about £50,000. Concentrated in the Western Islands.
3	"Traditional handframe" firms using linking and hand assembly to produce "Shetland" type garments. Sales of about £50,000, and concentrated in the Shetland and Orkney Islands of the North Coast.
4	"Upmarket" firms using large scale fully fashion machines and a variety of assembly methods to produce classic knitwear. Large, with sales averaging £2-3m, with some as large as £20m. Concentrated in the Borders area around Hawick.
5	"Midmarket niche" firms using both fully fashion and cheaper cut and sew technology to produce a variety of styles. Also large, with sales of around £4m. Concentrated in Ayrshire, on the far West Coast.
6	"Mass market contract" firms using mainly cut and sew and cheaper overlocking and cup seaming. Medium in size, averaging around £1-2m in sales. Concentrated in Glasgow.

Table 6

Image Matrix of Referent Densities Within and Between the Cluster Groups

Outdegree Cluster Number	Indegree Cluster Number 1	2	3	4	5	6
1	.09	.01	.01	.02	.00	.00
2	.03	.07	.01	.00	.01	.00
3	.03	.01	.06	.02	.01	.00
4	.02	.00	.01	.35	.05	.02
5	.02	.00	.01	.03	.40	.03
6	.00	.00	.00	.01	.06	.11

Note: Main diagonal entries are within cluster densities. Off-diagonal entries are between cluster densities. Based upon the 89 X 89 competitive referent matrix.

Appendix A

Four Cognitive Taxonomies Elicited from Interview Respondents

Respondent A:

"Scottish Knitwear"
- "Hawick"
- "Handknit"
  - "Very Basic"
  - "Designer"
- "Ayrshire Way"

Respondent B:

"Scottish Knitwear"
- "Handknitters"
- "Hawick"
  - "Large"
  - "Small"

Respondent C:

"Scottish Knitwear"
- "Traditional"
  - "Handframe"
  - "Handknit"
- "Automatic Machine"
  - "Shetland"
  - "Borders"
- "Designer"

Respondent D:

"Scottish Knitwear"
- "Hillfoot"
- "Hawick"
- "Small Designer Knitwear"
- "Borders-Huntley"
- "Western Ayrshire"

Note: Each indentation denotes another level in the taxonomic hierarchy.

Appendix B

Obtained Organizational Category Labels from Interview Data

Category Label	N (of 20)
Large firms	13
Borders	11
Small	11
Designer	8
Shetland	7
Traditional	6
Handknits	5
Ayrshire	4
Industrial	3
Medium	3
Handframe	2
Cashmere	2
Cut and Sew	2
Orkney	2
Hillfoot	2
Fine knits	1
Heavy knits	1
Niche specialists	1
Island	1
Automachine	1
Selfknitters	1
Outworkers	1
Multinational	1
Edinburgh	1
UK domestic	1
Export oriented	1
Fully fashioned	1
Lambswool	1
Natural fibers	1
Synthetic fibers	1
"School" knitwear	1
Kilthose	1
Club knitwear	1
Upmarket	1
Cheap and cheerful	1
Individual one-off	1

Appendix B (cont'd)

The seven summary categories gleaned from the above 37 labels and used in the questionnaire were as follows:

"Handknitters making traditional knitwear"

"Handknitters making designer knitwear"

"Handframe knitters making traditional knitwear"

"Handframe knitters making designer knitwear"

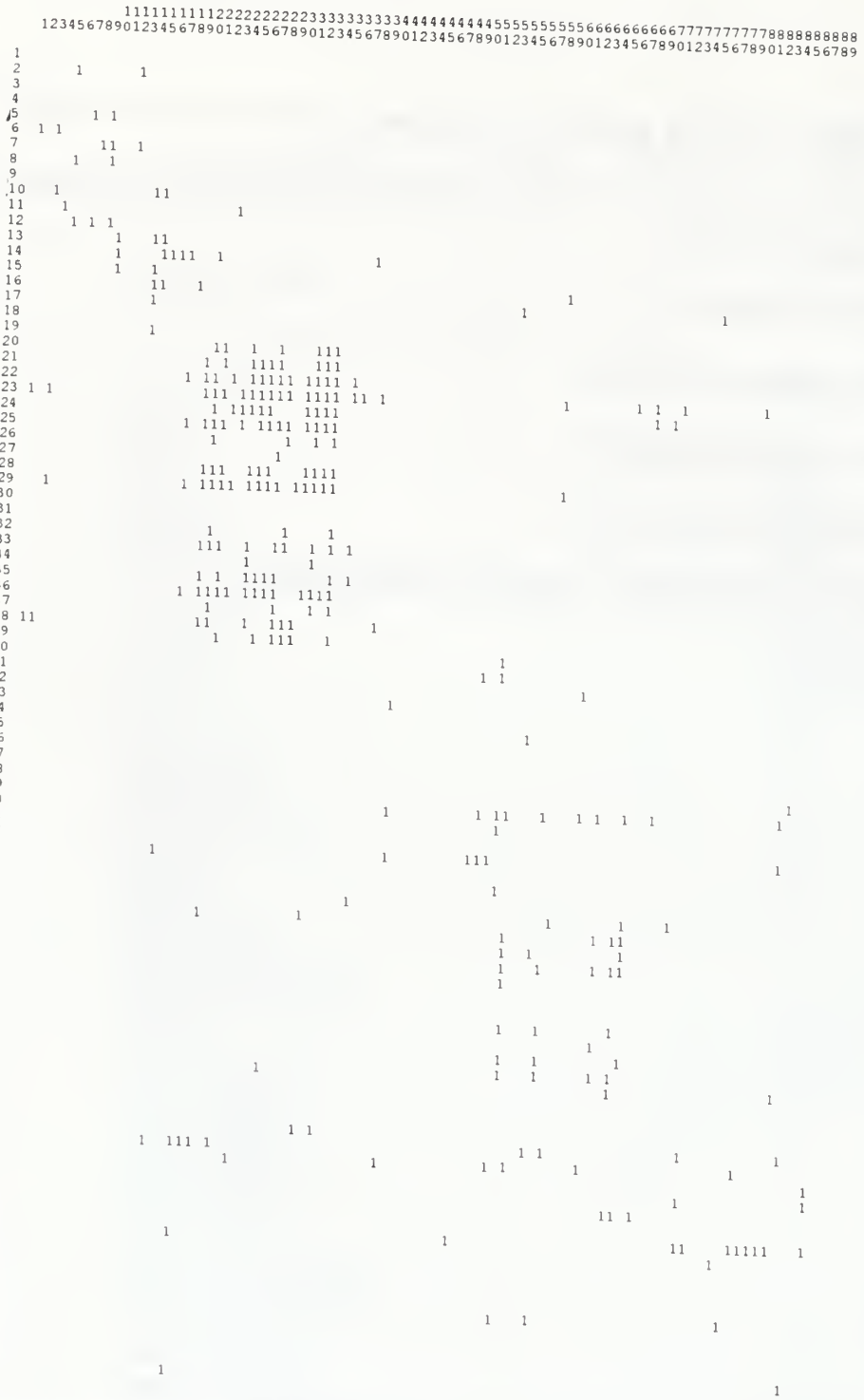
"Upmarket fully fashioned knitwear companies"

"Fully fashioned and cut and sew specialists in middle market niches"

"Mass market contract knitters"

Appendix C

89 X 89 Competitive Referent Matrix



Note: Each row/column is one company in the research sample. The six cluster groups consist of the following rows/columns: r/c 1-12 = Cluster 6 (Mass Marketers), r/c 13-18 = Cluster 5 (Mid Marketers), r/c 19-39 = Cluster 4 (Upmarket), r/c 40-53 = Cluster 2 (Handknitters), r/c 54-71 = Cluster 1 (High Fashion Handframers), and r/c 72-89 = Cluster 3 (Traditional Handframers).